1.0

U.S. ARMY INSTALLATION RESTORATION PROGRAM

RECORD OF DECISION

UMATILLA DEPOT ACTIVITY DEACTIVATION FURNACE SOILS OPERABLE UNIT

December 1992

Signed 1-8-93

In accordance with Army Regulation 200-2, this document is intended by the Army to comply with the National Environmental Policy Act of 1969 (NEPA)

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ACRONYMS AND ABBREVIATIONS

APE	Army Peculiar Equipment
ARAR	Applicable or Relevant and Appropriate Requirements
BRAC	Base Realignment and Closure
CDC	Center for Disease Control
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DoD	Department of Defense
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
EWI	Explosive Waste Incineration
FFA	Federal Facility Agreement
FS	Feasibility Study
IRP	Installation Restoration Program
LDR	Land Disposal Restrictions
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
ODEQ	Oregon Department of Environmental Quality
O&M	Operations and Maintenance
PNL	Battelle - Pacific Northwest Laboratory
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
TCLP	Toxicity Characteristic Leaching Procedure
TNT	Trinitrotoluene
TRC	Technical Review Committee
TSD	Treatment Storage and Disposal
UBK	Uptake biokinetic
UMDA	United States Army Depot Activity, Umatilla
USACE	United States Army Corps of Engineers
USATHAMA	United States Army Toxic and Hazardous Materials Agency

1. DECLARATION OF THE RECORD OF DECISION

1.1 SITE NAME AND LOCATION

U.S. Army Depot Activity, Umatilla
Deactivation Furnace, Soils Operable Unit
Hermiston, Oregon 97838-9544

1.2 STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Deactivation Furnace Soils Operable Unit at the U.S. Army Depot Activity, Umatilla (UMDA) in Hermiston, Oregon, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986 and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The decision was based on the administrative record for this site.

The remedy was selected by the United States Environmental Protection Agency (EPA) and the United States Army (Army). The State of Oregon concurs with the selected remedy.

1.3 ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health and welfare, or the environment.

1.4 DESCRIPTION OF THE SELECTED REMEDY

The selected remedy addresses contaminated soils at the Deactivation Furnace Soils Operable Unit and is the final remedial action planned for those soils. The function of the remedy is to reduce the risks associated with exposure to surficial soils and thus address one of the principle threats at the site. The major components of the selected remedy include the following:

- Excavation of soils surrounding the furnace having lead concentrations greater than 500 mg/kg (initially estimated to be 4,640 cubic yards or 6,264 tons of soil);
- Solidification and stabilization treatment of the excavated soils; and
- On-site disposal of the treated soils in the UMDA Active Landfill.

1.5 STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost effective. This remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable, and satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element.

Because this remedy will not result in hazardous substances remaining in on-site soils above health-based levels, the 5-year review will not apply to this action.

1.6 SIGNATURE AND SUPPORT AGENCY ACCEPTANCE OF THE SELECTED REMEDY

Signature sheets for the ROD for the Deactivation Furnace Soils Operable Unit follow.

LEAD AND SUPPORT AGENCY ACCEPTANCE
OF THE RECORD OF DECISION
U.S. ARMY DEPOT ACTIVITY UMATILLA,
DEACTIVATION FURNACE, SOILS OPERABLE UNIT

Signature sheet for the foregoing Record of Decision for the Deactivation Furnace Soils Operable Unit final action at the U.S. Army Depot Activity at Umatilla between the U.S. Army and the United States Environmental Protection Agency, with concurrence by the State of Oregon Department of Environmental Quality

Lewis D. Walker ______________________ 12/29/92

Lewis D. Walker
Deputy Assistant Secretary of the Army
(Environment, Safety, and Occupational Health)

Date

LEAD AND SUPPORT AGENCY ACCEPTANCE
OF THE RECORD OF DECISION
U.S. ARMY DEPOT ACTIVITY UMATILLA,
DEACTIVATION FURNACE, SOILS OPERABLE UNIT (CONT.)

Signature sheet for the foregoing Record of Decision for the Deactivation Furnace Soils Operable Unit final action at the U.S. Army Depot Activity at Umatilla between the U.S. Army and the United States Environmental Protection Agency, with concurrence by the State of Oregon Department of Environmental Quality

8 JAN 93

Lieutenant Colonel William D. McCune — Date
Commander, U.S. Army Depot Activity, Umatilla

LEAD AND SUPPORT AGENCY ACCEPTANCE
OF THE RECORD OF DECISION
U.S. ARMY DEPOT ACTIVITY UMATILLA,
DEACTIVATION FURNACE, SOILS OPERABLE UNIT (CONT.)

Signature sheet for the foregoing Record of Decision for the Deactivation Furnace Soils Operable Unit final action at the U.S. Army Depot Activity at Umatilla between the U.S. Army and the United States Environmental Protection Agency, with concurrence by the State of Oregon Department of Environmental Quality

Dana A. Rasmussen — 12/31/92

Dana A. Rasmussen
Regional Administrator, Region 10
U.S. Environmental Protection Agency

Date

LEAD AND SUPPORT AGENCY ACCEPTANCE
OF THE RECORD OF DECISION
U.S. ARMY DEPOT ACTIVITY UMATILLA,
DEACTIVATION FURNACE, SOILS OPERABLE UNIT (CONT.)

Signature sheet for the foregoing Record of Decision for the Deactivation Furnace Soils Operable Unit final action at the U.S. Army Depot Activity at Umatilla between the U.S. Army and the United States Environmental Protection Agency, with concurrence by the State of Oregon Department of Environmental Quality

Lydia R. Taylor, for — 1-4-93

Frederic J. Hansen — Date
Director
Oregon Department of Environmental Quality

Note: The State of Oregon's Letter of Concurrence is appended to this Record of Decision.

2. DECISION SUMMARY

This Decision Summary provides an overview of the problems posed by the conditions at the UMDA Deactivation Furnace, the remedial alternatives, and the analysis of those options. Following that, it explains the rationale for the remedy selection and describes how the selected remedy satisfies statutory requirements.

2.1 SITE NAME, LOCATION, AND DESCRIPTION

UMDA is located in northeastern Oregon in Morrow and Umatilla Counties, approximately 8 miles west of Hermiston, Oregon, as shown in Figure 1. The installation occupies approximately 19,700 acres of land. The UMDA Deactivation Furnace is located in the southwest corner of the UMDA installation as shown in Figure 2.

The Deactivation Furnace buildings and gravel-surfaced hardstand cover approximately 1.2 acres. In July 1992, the actual furnace within the buildings was decontaminated and removed from the site and disposed or salvaged as nonhazardous solid waste during a Resource Conservation and Recovery Act (RCRA) closure action. During the RCRA closure action, hazardous waste (e.g., baghouse ash and rinse water) collected during cleaning and removal of the furnace equipment was disposed of at the RCRA-permitted hazardous waste treatment, storage, and disposal (TSD) facility in Arlington, Oregon. The remaining buildings are approximately 25 feet by 50 feet and 15 feet by 40 feet with concrete floors. The larger building is roofless. A concrete slab totaling approximately 2,500 square feet surrounds the buildings.

Surface water that collects on the concrete floor and perimeter slab is drained into an open bottomed sump. The gravel hardstand and concrete slabs around the building encompass approximately 1.1 acres. Beyond the gravel hardstand, the terrain blends into a very subtle, east-west trending hummock, with vegetation characterized by sagebrush, bluebrush, wheatgrass, cheatgrass,

FIGURE 1
FACILITY LOCATION MAP

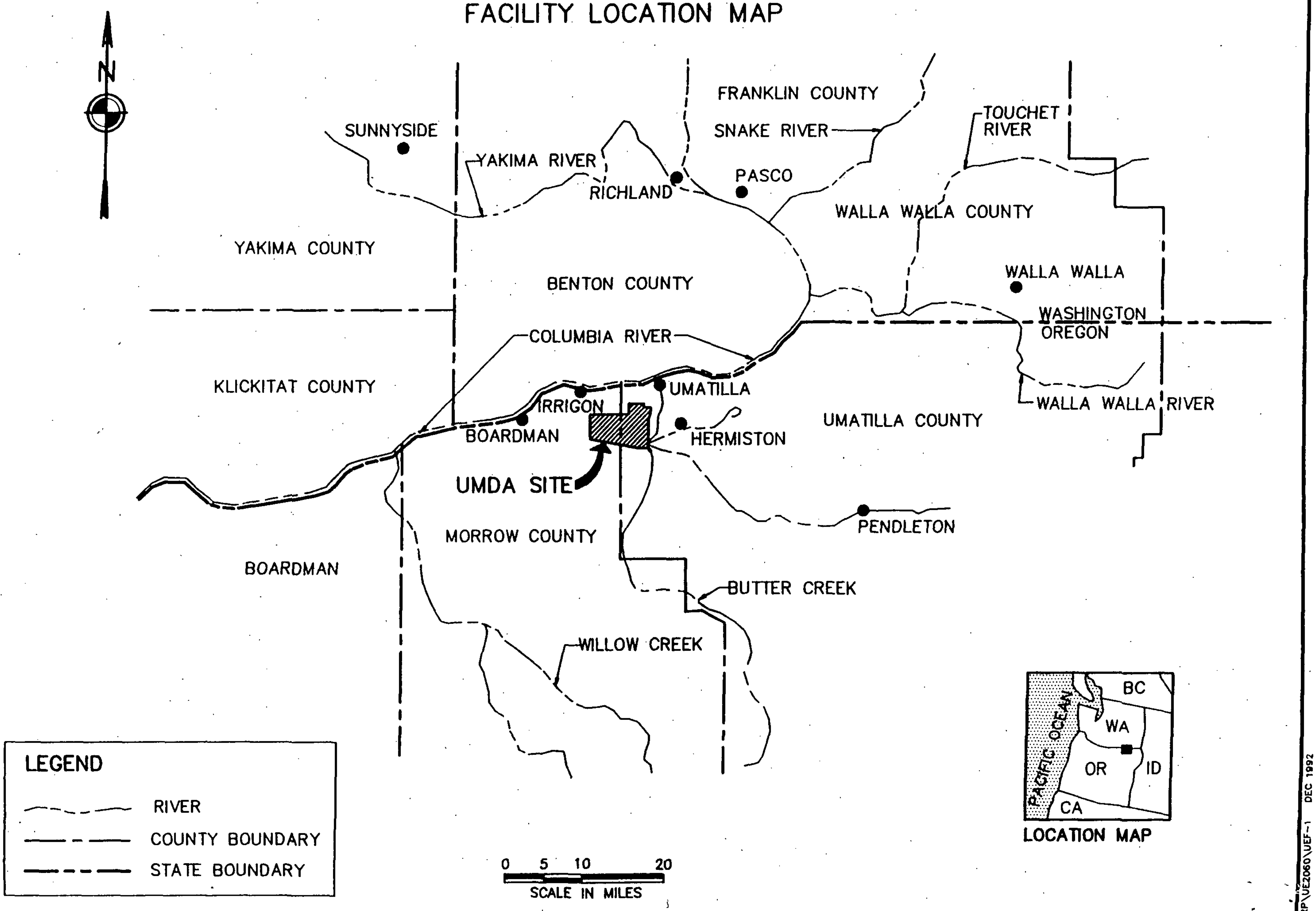
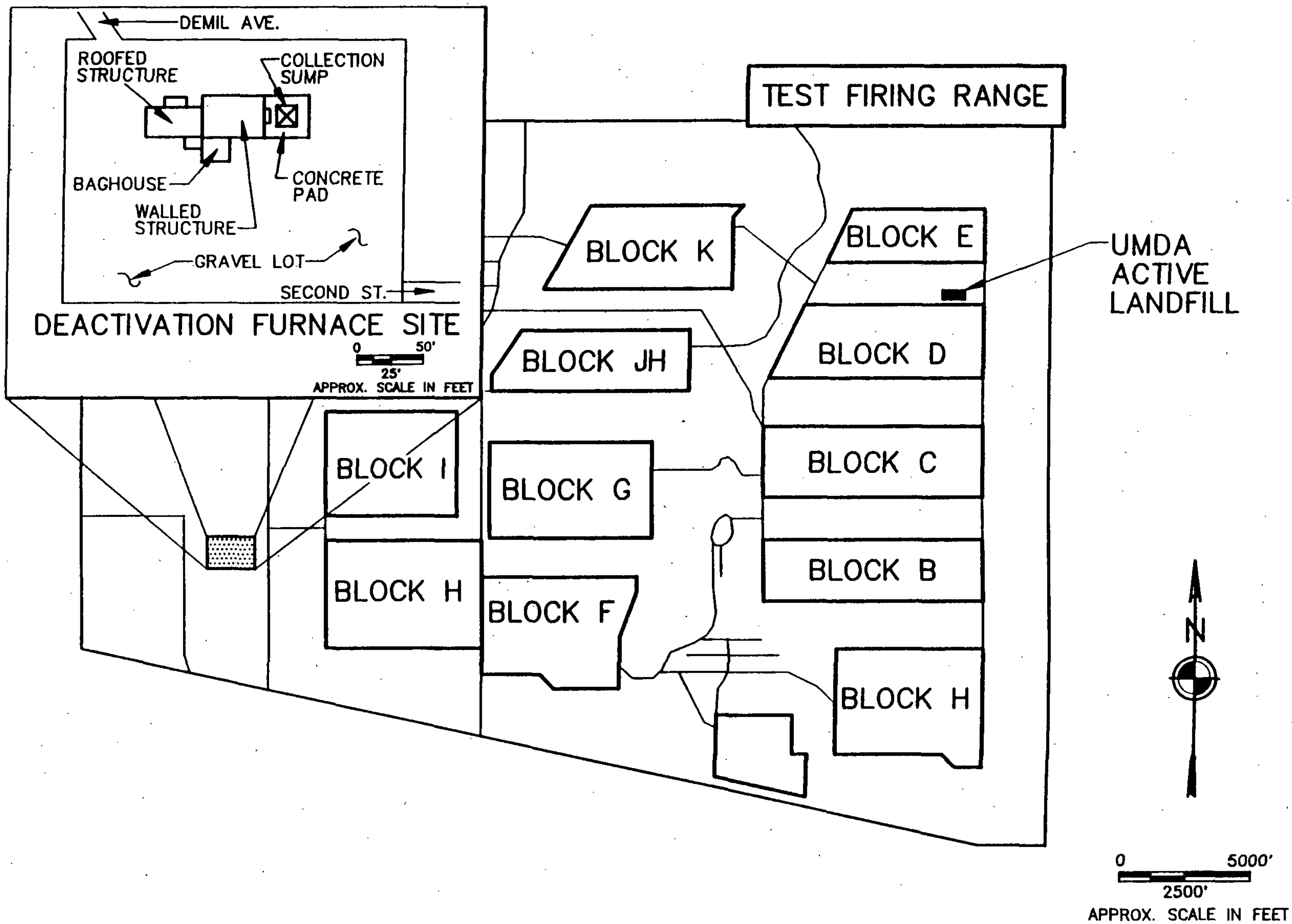


FIGURE 2
LOCATION OF DEACTIVATION FURNACE SITE



and bitterbrush. Two railroad lines, extending from north of the site, converge along the western fringe of the gravel hardstand and continue to the south as one line.

UMDA was established as an Army ordnance depot in 1941 for the purpose of storing and handling munitions. The current and near-future mission of the installation is continued munitions storage, chemical weapons destruction, and site remediation. Access currently is restricted to military personnel and authorized contractors. After its chemical demilitarization mission is completed, the installation may be scheduled for future realignment under the Department of Defense (DoD) Base Realignment and Closure (BRAC) program. Under this program, the Army may eventually vacate the site. Ownership could then be relinquished to another governmental agency or private interests. Light industry is considered to be the most likely future land use scenario; future residential and/or agriculture use also is possible.

Northeastern Oregon, the setting for UMDA, is characterized by a semi-arid, cold desert climate, an average annual precipitation of 8 to 9 inches, and a potential evapotranspiration rate of 32 inches. The installation is located on a regional plateau of low relief that consists of relatively permeable glaciofluvial sand and gravel overlying Columbia River Basalt.

Groundwater occurs primarily in two settings: an unconfined aquifer within the overlying deposits and weathered basalts, and a vertical sequence of semiconfined and confined aquifers within the basalt. Groundwater flows trend to the north and northwest. However, regional flow gradients in the uppermost aquifer are influenced by irrigation, pumping, and leakage from irrigation canals. The Columbia River flows from east to west approximately 3 miles to the north of the UMDA boundary, and the Umatilla River flows from south to north approximately 1 to 2 miles to the east. No natural streams occur within UMDA; the facility is characterized by areas of closed drainage.

The region surrounding UMDA primarily is used for agriculture. The population centers closest to UMDA are Hermiston (population 10,075), approximately 8 miles east; Umatilla (population 3,032), approximately 6 miles northeast; and Irrigon (population 820), approximately 2 miles northwest. The total populations of Umatilla and Morrow Counties are approximately 59,000 and 7,650, respectively.

Approximately 1,470 wells have been identified within a 4-mile radius of UMDA, the majority of which are used for domestic and irrigation water. Three municipal water systems draw from groundwater within a 4-mile radius of UMDA, including Hermiston, Umatilla, and Irrigon. The

Columbia River is a major source of potable and irrigation water, and also is used for recreation, fishing, and the generation of hydroelectric power. The principal use of the Umatilla River is irrigation.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Deactivation Furnace is technically described as an Explosive Waste Incinerator (EWI), and is designated as an Army Peculiar Equipment (APE) 1236 Deactivation Furnace in the inventory of the U.S. Army Armament Munitions and Chemical Command. The furnace was used to incinerate unserviceable or obsolete munitions up to 50 caliber (e.g., cartridges, mines, boosters, primers, fuses, grenades, charges, and detonators). The incineration process was designed to remove propellant, explosive, and/or pyrotechnic wastes from recoverable metals such as brass, lead, and steel, leaving a non-reactive ash residue. The furnace was operated from the late 1950s until November 1988.

During furnace operation, munitions were fed into the retort through a conveyor belt system. Standard furnace operating temperatures ranged from highs of 1200°F to 1500°F and lows to 400°F at the cool end of the retort. Exhaust gases were directed from the retort to a cyclone and baghouse for ultimate collection and disposal of the ash particulates. Established time and temperature operating parameters were maintained to control the completeness of the deactivation process. Discharged metal components were visually inspected for any obvious residues of the explosive constituents and were tested periodically with Webster's reagent to determine the presence of trinitrotoluene (TNT).

Standard operating procedures called for residual ash from the furnace baghouse and cyclone to be placed in disposal bags for temporary storage in Building 203. A fenced portion of the interior of Building 203 was, and remains, the single RCRA-permitted hazardous waste storage facility on UMDA. There is no approved disposal area for hazardous waste on UMDA. The closest RCRA-permitted hazardous waste disposal facility is in Arlington, Oregon, 50 miles west of UMDA.

The Deactivation Furnace operated for approximately 10 years prior to the addition of cyclone and baghouse air pollution controls in the 1960s. The initial air pollution equipment was replaced by the present baghouse system between 1975 and 1980.

Past operations at the UMDA Deactivation Furnace soils site have resulted in the contamination of adjacent shallow soil deposits largely through the windblown deposition of furnace stack particulates and occasional spilling and/or dumping of residual furnace ash and munitions incineration debris (e.g., spent ammunition casings). During the remedial investigation (RI), 12 metals in the top 2 feet of soil were determined to have at least one value (in 62 or 63 samples) that exceeded a background value derived from a site at the UMDA border, upwind from the furnace site. The metals detected above background concentrations were: antimony, arsenic, barium, beryllium, cadmium, copper, lead, nickel, potassium, silver, thallium, and zinc. These metals generally exhibit similar patterns of distribution in the soil. Concentrations are typically highest with close proximity to the furnace structures and immediate gravel hardstand area. An increased occurrence in the predominant northeast, downwind direction is evident. Contamination is highest in the upper few inches of soil, and progressively decreases with depth at rates varying according to the specific metal. The extent of the lateral migration and the magnitude of the concentrations present vary significantly, however, between the 12 metals of concern. Lead and cadmium were found to be the most widespread contaminants in the soils.

UMDA was included in the Army's Installation Restoration Program (IRP) in October 1978. An element of the IRP work at UMDA consisted of performing an environmental contamination survey at several sites suspected to be contaminant sources. The survey was conducted by the Battelle-Pacific Northwest Laboratory (PNL) from January to November 1981, and involved a limited program of soil and groundwater sampling and testing at each site.

A single sample of surface soil was recovered by PNL from the Deactivation Furnace soils site. High concentrations of lead (7,300 mg/kg), zinc (820 mg/kg), copper (500 mg/kg), and cadmium (35 mg/kg) were detected. The specific sampling location is unknown. The PNL report concluded that the presence of high metal concentrations in the soil was the result of atmospheric deposition of furnace stack emissions. It is probable that these emissions occurred to a greater degree prior to the installation of the baghouse.

A RCRA Facility Assessment was issued in 1987. Based on recommendations from EPA Region 10 following this assessment, an investigation under the Army's IRP was performed at several UMDA sites by Weston, Inc., from April through September 1988. Sampling at the Deactivation Furnace soils site involved compositing surface soil (0- to 3-inch depth) from seven locations downwind (northeast) of the furnace, and analyzing the single composite for the priority pollutant metals and Extraction Procedure toxicity. A boring also was advanced downwind of the furnace, with discrete soil samples retrieved at depths of 2.5, 5.0, 7.5, and 10.0 feet. Borehole samples were analyzed for priority pollutant metals only.

High bulk metal concentrations were recorded in the composited surface soil for lead (28,000 mg/kg), copper (1,100 mg/kg), antimony (210 mg/kg), cadmium (32 mg/kg), and silver (11.8 mg/kg). Significant findings of the Weston 1988 report are highlighted below.

- Based on chemical analyses of soil samples recovered from 2.5 to 10.0 feet in depth, the Weston report noted that heavy metals did not appear to be migrating downward through the surface soil and threatening the alluvial aquifer.
- Only lead was found to exceed RCRA criteria for classification as a hazardous waste as determined through the Extraction Procedure toxicity method.

On 31 October 1989, a Federal Facility Agreement (FFA) was entered into by EPA Region 10, the Oregon Department of Environmental Quality (ODEQ), and the Department of the Army, UMDA. The FFA identifies the Army as the Potentially Responsible Party for the installation. One of the purposes of the FFA was to establish the legal framework to investigate environmental impacts associated with past and present activities at UMDA, and to develop, implement, and monitor appropriate remedial actions in accordance with CERCLA, the NCP, Superfund guidance and policy, RCRA, RCRA guidance and policy, and applicable state law. The Deactivation Furnace is listed as one of several "operable units" covered by the FFA.

The UMDA Deactivation Furnace was functioning under interim status as a hazardous waste treatment facility at the time of its final operation in November 1988. In compliance with 40 CFR 265.111 (Closure Performance Standard), a RCRA closure plan was developed by UMDA in February 1990 and was approved in amended form by ODEQ in October 1990. This initial closure plan was to include the dismantling and removal of the furnace and related structures as well as the removal of all soil contaminated by the furnace emission particulates. This plan was based on a very limited amount of soil contamination data available at that time.

The closure plan specified that soils classified as RCRA hazardous waste would be excavated, placed in drums, and stored at the RCRA-approved hazardous waste storage area in Building 203 for eventual treatment and disposal through the CERCLA process as provided in the FFA. It was estimated that 40 cubic yards (cu. yd.) of hazardous waste were present at the furnace site.

An RI and feasibility study (FS) of the entire UMDA installation, including the Deactivation Furnace unit, was initiated in 1990 to determine the nature and extent of contamination and to identify alternatives available to clean up the facility. Based on the results of the RI it became apparent in May 1991 that soil contamination at the furnace site was probably much more extensive than initially envisioned. Laboratory data confirmed that widespread soil contamination existed at the site. However, the completed RI sampling did not extend far enough from the furnace structure to adequately define the limits of soil contamination above background for the region.

The United States Army Corps of Engineers (USACE), Seattle District conducted supplementary field sampling work (Phase 1 in June 1991 and Phase 2 in April 1992) to complete the definition of soil contamination at the site. Regarding the RCRA closure plan, ODEQ agreed that a revised plan would be required, and requested that the USACE Seattle District prepare that document. Agreement was reached between UMDA, EPA Region 10, and ODEQ that the closure plan would be limited solely to actions related to the furnace equipment, and that the larger soil contamination issue would be handled through an expedited CERCLA process, commencing with a site-specific FS. A revised draft closure plan for the Deactivation Furnace was submitted by USACE Seattle District in May 1992.

The following documents outline the results of the site investigations and assessments of cleanup actions for the Deactivation Furnace:

1. *Remedial Investigation Report for the Umatilla Depot Activity, Hermiston, Oregon.* Prepared by Dames & Moore for the U.S. Army Toxic and Hazardous Materials Agency, 1992.

2. *Human Health Baseline Risk Assessment for the Umatilla Depot Activity, Hermiston, Oregon.* Prepared by Dames & Moore, Inc. for the U.S. Army Toxic and Hazardous Materials Agency, 1992.

3. *Ecological Assessment Report for the Umatilla Army Depot Activity, Hermiston, Oregon.* Prepared by Dames & Moore for the U.S. Army Toxic and Hazardous Materials Agency, 1992.

4. *Feasibility Study for the Deactivation Furnace Soils of Operable Unit, Umatilla Depot.* Prepared by the U.S. Army Corps of Engineers, Seattle District and Ecology and Environment, Inc. for the U.S. Army Toxic and Hazardous Materials Agency, 1992.

2.3 HIGHLIGHTS OF COMMUNITY PARTICIPATION

In 1988, the UMDA command assembled a Technical Review Committee (TRC) composed of elected and appointed officials and other interested citizens from the surrounding communities. Quarterly meetings provide an opportunity for UMDA to brief the TRC on installation environmental restoration projects and to solicit input from the TRC. Two TRC meetings were held during preparation of the supplemental investigation and FS for the Deactivation Furnace Soils Operable Unit. In those meetings, the TRC was informed of the scope and methodology of the soils investigation and remediation.

The Feasibility Study and Proposed Plan for the Deactivation Furnace Soils Operable Unit were released to the public on August 31, 1992. The public comment period started on that date and ended on September 30, 1992. The documents constituting the administrative record were made available to the public at the following locations: UMDA Building 1, Hermiston, Oregon; the Hermiston Public Library, Hermiston, Oregon; and the EPA offices in Portland, Oregon. The notice of availability of the Proposed Plan was published in the East Oregonian newspaper.

A public meeting was held at Armand Larive Junior High School, Hermiston, Oregon, on September 15, 1992, to inform the public of the preferred alternative and to seek public comments. Approximately eight persons from the community and media attended the meeting. At this meeting, representatives from UMDA, the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), EPA, ODEQ, and USACE, Seattle District, presented information about the site and remedial alternatives under consideration. No comments were received at the public meeting or during the public comment period, as indicated in the Responsiveness Summary (Section 3).

2.4 SCOPE AND ROLE OF OPERABLE UNIT

Operable units are discrete actions that constitute incremental steps toward the final overall remedy. Operable units can be actions that completely address a geographic portion of a site or a specific problem, or can be one of many actions that will be taken at the site.

The Deactivation Furnace Soils Operable Unit includes contaminated soil surrounding the Deactivation Furnace structures. Contaminated soils surrounding the Decontamination Furnace include the railroad track ballast. Associated debris in the operable unit includes the building structures, concrete pads, and railroad ties and rails. Groundwater was not impacted by contaminants associated with the Deactivation Furnace soils. The soils operable unit cleanup strategy presented here is considered a final action only for the soil, building structures, concrete pads, and railroad tracks.

UMDA groundwater is being addressed on an installation-wide basis. The final remedial actions for the groundwater and the remaining portions of the UMDA installation will be proposed following completion of ongoing investigations.

2.5 SITE CHARACTERISTICS

The primary source of soil contamination at the UMDA Deactivation Furnace was furnace stack particulate emissions. These particulates were contaminating the surrounding soils through windblown deposition. In addition, residual furnace ash and munitions incineration debris (e.g., spent ammunition casings) were occasionally spilled and/or dumped on the soils.

Several soil investigations have been conducted at the Deactivation Furnace from 1981 to present. Samples collected from the surface and from soil borings were used to determine the vertical and horizontal extent of soil contamination. The investigation results are summarized as follows:

- **Lead is the primary contaminant with respect to concentration and both horizontal and vertical extent.** Other metals found at elevated levels included antimony, arsenic, barium, beryllium, cadmium, copper, nickel, potassium, silver, thallium, and zinc. Physical and chemical properties of the contaminants are summarized in Table 1. The extent of lead contamination is such that cleanup of lead contaminated soil to 500 mg/kg will concurrently reduce the other metals to near their regional background levels. The lateral and vertical extent of soil contamination at lead concentrations greater than 500 mg/kg is illustrated in Figure 3. Low concentrations of 2,4-DNT and nitrate/nitrite were detected in soil in the sump area. Explosives or other organic constituents were not encountered within the soil outside the sump.

- **The maximum lead concentration found was 83,000 mg/kg as compared to a background lead value of 8.37 mg/kg.** The total quantity of soil with concentrations above background is estimated to be 29,868 cubic yards. Approximately 4,640 cubic yards of soil encompassing approximately 4 acres were estimated to contain lead at concentrations greater than 500 mg/kg.

- **The maximum vertical extent of contamination above background concentrations is estimated to be 30 inches.** Lead at concentrations above 500 mg/kg was found at depths no greater than 15 inches. Groundwater exists locally at a depth of approximately 60 feet below ground surface.

- **Soil with higher lead concentrations demonstrated RCRA hazardous waste characteristics.** Toxicity Characteristic Leaching Procedure (TCLP) extract from soil containing greater than 900 mg/kg typically contained lead at concentrations greater than 5 mg/L. Therefore, approximately 2,962 cubic yards of soil containing greater than 900 mg/kg of lead would likely be a RCRA D008 characteristic hazardous waste upon excavation.

Potential routes for migration of lead and other metals in soil include the following:

- Air: Airborne transport of soil contaminants might occur via the dispersion of soil particles, particularly if soil-disturbing activities are performed.

- Surface Water: There is little potential for surface water transport of the lead and/or other metals. Deactivation Furnace soils are not located within a floodplain, there are no natural or manmade drainage channels entering or exiting the site, and the site topographic gradient is shallow at a maximum of 4 percent. The low precipitation rate and high soil permeability limit the amount of surface water runoff developing in the area.

Table 1

RANGE OF INORGANIC CONCENTRATIONS DETECTED IN SURFACE SOILS TO A DEPTH OF 2 FEET[a] (mg/kg)

Analyte	Range of Detected Concentrations		Upper 95 Percent Confidence Limit[b]	Comparison Criteria		Percent Positive Detections[c]	Percent Exceeding Background Criteria[c]
	Minimum	Maximum		Background	Detection Limits		
Aluminum	2,970	6,900	4,832	8,604	DLNA	100	0
Antimony	7.04	1,400	78.1	3.8	3.8 - 3.8	46	46
Arsenic	0.863	11.8	2.58	5.24	DLNA	100	3
Barium	82.2	980	202	233	300 - 300	98	13
Beryllium	2.9	2.9	1	1.86	0.33 - 1.86	2	2
Cadmium	3.88	32	5	3.05	3.05 - 61	22	22
Calcium	3,560	11,000	6,285	29,006	DLNA	100	0
Chromium	17.2	17.2	6.81	32.7	12.7 - 12.7	2	0
Copper	90.7	210,000	8,925	58.6	58.6 - 58.6	22	22
Iron	12,000	26,000	19,165	26,233	DLNA	100	0
Lead	3.97	30,000[d]	2,618	8.37	DLNA	100	84
Magnesium	2,990	5,920	4,560	8,585	DLNA	100	0
Manganese	280	574	481	874	DLNA	100	0
Nickel	21.2	32.1	8.17	12.6	12.6 - 12.6	5	5
Potassium	905	2,750	1,526	2,179	DLNA	100	3
Silver	0.03	1.94	0.222	0.038	0.025	68	61
Sodium	229	570	400	978	150 - 150	98	0
Thallium	34.9	35.6	28.7	31.3	7.93 - 630	3	3

Table 1

RANGE OF INORGANIC CONCENTRATIONS DETECTED IN SURFACE SOILS TO A DEPTH OF 2 FEET[a] (mg/kg)

Analyte	Range of Detected Concentrations		Upper 95 Percent Confidence Limit[b]	Comparison Criteria		Percent Positive Detections[c]	Percent Exceeding Background Criteria[c]
	Minimum	Maximum		Background	Detection Limits		
Vanadium	31.9	120	73.6	131	DLNA	100	0
Zinc	36.1	97,000	4,257	94	30.2 - 30.2	87	51

DLNA - Detection limit could not be ascertained because the analyte was dectected in all samples.

(a) - Data reported includes only that from the remedial investigation report. Supplemental sampling data generated by USACE Seattle District not included.

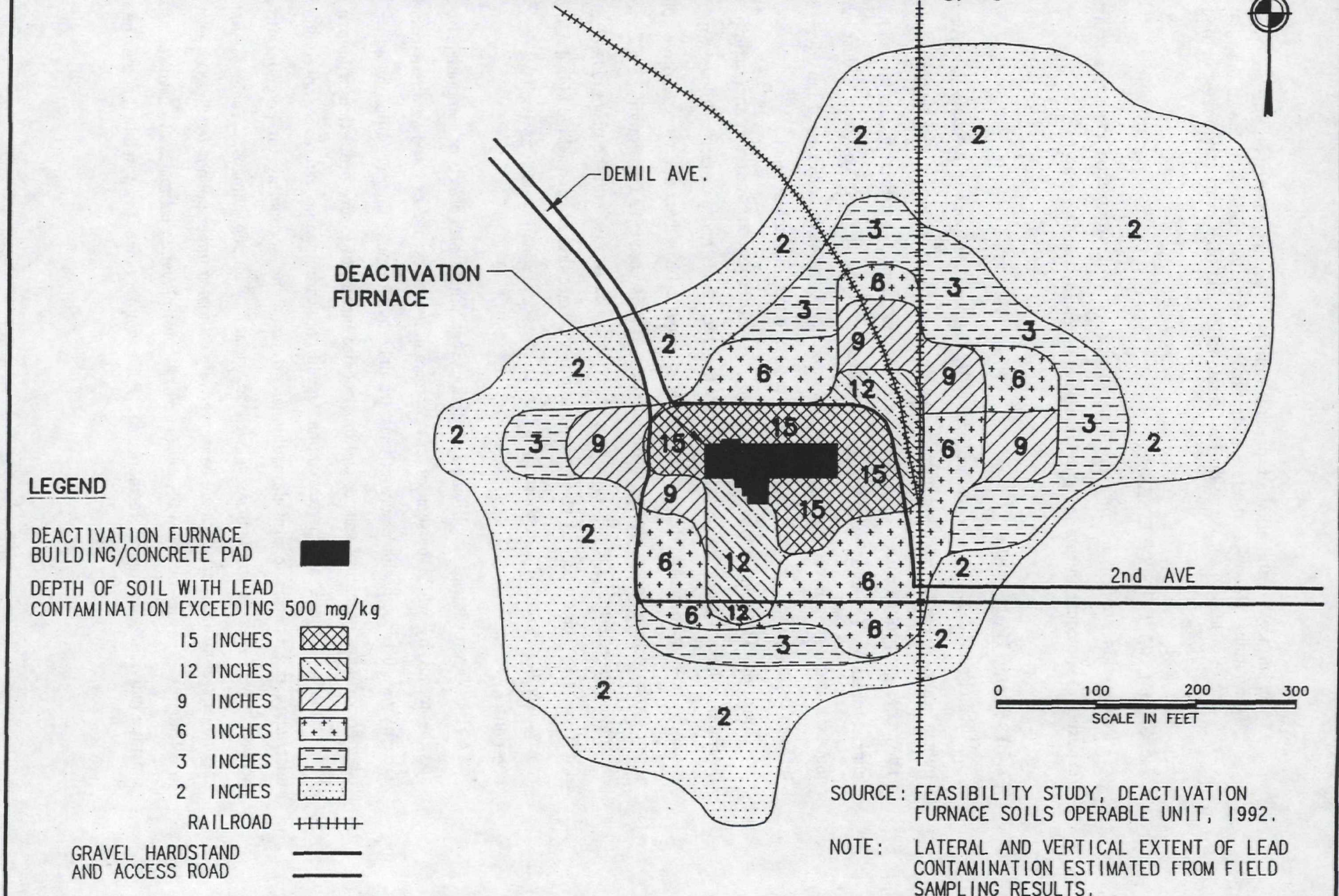
(b) - Upper 95 percent confidence limit on the arithmetic mean. Calculated asuming one-half the detection level as the concentration for those samples in which a given analyte was not detected.

(c) - Total number of samples collected ranged from 62 to 63.

(d) - Maximum lead concentration identified in supplemental USACE Seattle District samples was 83,000 mg/kg.

FIGURE 3

ESTIMATED EXTENT OF LEAD CONTAMINATED SOIL WITH CONCENTRATIONS GREATER THAN 500 mg/kg



SOURCE: FEASIBILITY STUDY, DEACTIVATION FURNACE SOILS OPERABLE UNIT, 1992.

NOTE: LATERAL AND VERTICAL EXTENT OF LEAD CONTAMINATION ESTIMATED FROM FIELD SAMPLING RESULTS.

- Subsurface: Infiltration of precipitation provides a potential subsurface pathway for migration. However, the rate of transport is expected to be low due to the high sorptive nature of lead to soils, and the low precipitation and high evaporation rates in the region.

2.6 SUMMARY OF SITE RISKS

This section summarizes the human health risks and environmental impacts associated with exposure to site contaminants and provides potential remedial action criteria.

2.6.1 Human Health Risks

A baseline risk assessment was conducted by Dames & Moore to estimate the risk posed to human health by the Deactivation Furnace should it remain in its current state with no remediation. The risk assessment consisted of an exposure assessment, toxicity assessment, and human health risk characterization. The exposure assessment detailed the exposure pathways (such as dust inhalation) that exist at the site for various receptors. The toxicity assessment documented the adverse effects that can be caused in a receptor as a result of exposure to a site contaminant.

The health risk evaluation used both the exposure concentrations and the toxicity data to determine a hazard index for potential noncarcinogenic effects and a cancer risk level for potential carcinogenic contaminants. If the hazard index is below 1, then even the most sensitive population is not likely to experience adverse health effects. If it is above 1, there might be a concern for adverse health effects. The degree of concern typically correlates with the magnitude of the index if it is above 1. The cancer risk level is the additional chance that an exposed individual will develop cancer over the course of a lifetime. It is expressed as a probability such as 1×10^{-6} (i.e., one in one million).

A risk assessment uses simplifying assumptions regarding health effects of compounds of concern and the means by which persons or environmental receptors are exposed to these compounds. Toxicity measures or health effects criteria are uncertain because they are often based on limited laboratory studies on animal species and thus require factors to assure protection of human health. For example, Table 2 summarizes human health noncarcinogenic reference doses and shows uncertainty factors used to provide additional protection by accounting for potential differences between tested species and humans as well as variability among humans. Table 3 summarizes carcinogenic slope factors, which are conservatively estimated upper bounds for these effects. Also, in calculating exposure to chemicals of concern, highest plausible estimates are used to assure that sensitive individuals or groups are addressed. For example, since it is possible that the site might

Table 2

NONCARCINOGENIC HEALTH EFFECTS CRITERIA FOR CONTAMINANTS OF CONCERN DEACTIVATION FURNACE, UMDA

Metal	Oral RfD (mg/kg-day)	Uncertainty Factor	Confidence	Critical Oral Route Effect	Inhalation RfC (mg/m^3)	Uncertainty Factor	Confidence	Critical Inhalation Route Effect
Antimony	4.00E-4	1,000	Low	Longevity, blood glucose	ND	—	—	—
Arsenic	3.00E-4	3	Medium	Hyperpigmentation, keratosis, vascular complications	ND/Review	—	—	—
Barium	7.00E-02	3	Medium	Hypertension	1.40E-04	1,000		Fetotoxicity
Beryllium	5.00E-03	100	Low	NOAEL, highest level tested	ND	—	—	—
Cadmium	5.0E04 (water) 1.0E-03 (diet)	10	High	Proteinurea	ND/Review	—	—	—
Copper	3.70E-2	1	Low	Maximum Contamination Level (drinking water)	1.00E-02	--	Low	--
Lead[a]	Inappropriate	--	--	Neurotoxicity in children	Inappropriate	--	--	--
Nickel	2.0E-02 (soluble salts)	300	Medium	Decreased body, liver and spleen weight	ND/Review	--	--	--
Potassium	Insufficient Data				Insufficient Data			
Silver	5.00E-03	3	Low	Skin discoloration	Insufficient Data	--	--	--
Thallium	8.00E-05	3,000	Low	NOAEL, highest level tested	ND	--	--	--
Zinc	2.00E-01	100	--	Anemia	ND	--	--	--

ND = Not determined
Review = Under review
NOAEL = No observed adverse effect level

(a) - Health effects criteria for lead based on the probability of lead levels in children's blood using the lead uptake biokinetic (UBK) model.

Sources: Health effects criteria shown are those values used in the remedial investigation which relied on the Integrated Risk Information System (IRIS), January 1991, and the Health Effects Assessment Summary Table (HEAST), First Quarter 1991.

Table 3

CARCINOGENIC HEALTH EFFECTS CRITERIA FOR CONTAMINANTS OF CONCERN DEACTIVATION FURNACE, UMDA

Metal	Weight of Evidence Classification[a]	Oral Slope Factor $(mg/kg\text{-}day)^{-1}$	Type of Cancer	Inhalation Unit Risk $(\mu g/m^3)^{-1}$	Type of Cancer	Source
Arsenic	A	1.75E+00	Skin tumors	1.4E+01	--	HEAST
Beryllium	B2	4.30+00	Gross tumors, all sites	8.4E+00	--	IRIS/HEAST
Cadmium	B1	ND	--	6.3E+00	Lung cancer, tracheal and bronchial tumors	IRIS/HEAST
Lead	B2	ND	Renal tumors	ND	Digestive tract, respirator system, peritoneum	IRIS
Nickel (soluble salts)	A	ND	—	8.4E-01 1.7E+00	Lung and nasal tumors (higher value, for nickel subsulfate, was used.	

(a) - According to EPA weight of Evidence Classification, an A carcinogen is a human carciongen; B carcinogens are probable human carcinogens, with B1 having limited human data available and B2 having sufficient evidence in animals and inadequate or no evidence in humans.

Sources: Health effects criteria shown are those values used in the remedial investigation which relied on the Integrated Risk Information System (IRIS), January 1991, and the Health Effects Assessment Summary Table (HEAST), First Quarter 1991.

be used in the future for residences, exposures to the contaminants (especially lead) were calculated for the most sensitive population, children from the ages 0 to 7 years old, although children may never occupy the site. Other possibly significant sources of uncertainty in the risk assessments are: airborne dust models that could over- (or under-) state exposure to human receptors, crop and game consumption as a means of exposure to chemicals of concern, exposure frequencies and durations for humans and environmental receptors, and the assumption that cancer risk and noncancer hazards from different chemicals are additive.

Contaminants of concern in the UMDA Deactivation Furnace Soils Operable Unit were identified as those metals detected in soil samples that exceeded UMDA background concentrations in at least one sample.

They were:

- Antimony
- Arsenic
- Barium
- Beryllium
- Cadmium
- Copper
- Lead
- Nickel
- Potassium
- Silver
- Thallium
- Zinc

The risk of exposure to the population of these metals was identified by considering both current and future use scenarios. Currently, public access to the UMDA facility is restricted, and there is little incentive or opportunity for trespassers to approach the furnace area, so public exposure is unlikely. There are no operations being conducted in the furnace area other than remediation, so unplanned exposure of military personnel also is unlikely. Therefore, the potential for current exposure was judged to be low and risks associated with current exposure scenarios were not evaluated.

Future site use may vary from its current state. Although the ordnance storage mission at UMDA has been transferred to another installation, the base is to remain open until its chemical demilitarization mission is completed. After this period, UMDA may be scheduled for future realignment under the Department of Defense (DoD) Base Realignment and Closure (BRAC) program. Under this program, the Army may eventually vacate the site. Ownership could then be relinquished to another government agency or private interest. Light industrial land use is considered a potential scenario for future use of UMDA based on site topography and the availability of utilities and resources; however, future residential use also is possible. Because it is more conservative, residential use was evaluated in the risk assessment. The exposed population in this scenario would consist of site residents, including both adults and children.

The exposure pathways for each of these future use scenarios were identified. Those pathways with the probability of providing significant exposures include the following:

- Incidental ingestion of soil,
- Dust inhalation, and
- Crop ingestion.

For purposes of calculating exposure, soil concentrations of the metals of concern were assumed to be the 95 percent upper confidence limit on the arithmetic mean of sampling data. Using these concentrations and exposure factors obtained from EPA's *Risk Assessment Guidance for Superfund*, chronic daily intake factors for each chemical within each exposure pathway for a given population at risk were calculated.

The risks estimated were of three kinds: 1) carcinogenic, 2) noncarcinogenic hazard estimates for all metals except lead, and 3) an uptake model for children ages 0 to 7 years which predicts the concentration of lead in blood.

The basic toxicity information and health effects criteria used to calculate risk and the models from which the risk values were derived are provided in Tables 2 and 3. All metals are potentially toxic. In addition, arsenic, beryllium, cadmium, lead, and nickel are classified as potential human carcinogens. Using this toxicity assessment and the calculated chronic daily intake factors, excess cancer risks and noncancerous hazard indices were calculated for each of these pathways and under the residential scenario, assuming that no remediation of soils takes place. The results are summarized in Table 4. Cumulative risks are shown for each of the exposure pathways evaluated. The cumulative risks do not include those from lead or potassium. There is insufficient toxicity data to calculate risks from potassium. Risks due to lead were evaluated independently and are discussed below.

The NCP states that the acceptable risk range for carcinogens is 1×10^{-4} to 1×10^{-6}, and for noncarcinogens a hazard index of less than 1. The noncarcinogenic hazard index acceptable value is exceeded under the residential use scenarios. Therefore, actual or threatened releases of hazardous substances from the site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

In the case of human exposure to lead, children are more at risk than adults. Excessive amounts of lead in the human system have been linked to impaired neuro-behavioral development, kidney damage, anemia, and hypertension in children. Adverse health impacts to children are closely related

Table 4

SUMMARY OF CARCINOGENIC AND NONCARCINOGENIC RISKS FROM METALS OTHER THAN LEAD (ASSUMING NO REMEDIATION OCCURS)

Pathway	Residential Use	
	Cancer Risks[a]	Noncancer Risks[b]
Incidental Ingestion of Soil	1E-05	3.0
Inhalation of Dust	9E-09	0.0006
Consumption of Crops	1E-05	40.0
Combined Pathways Total Risk	2E-05	3.0

a - Excess lifetime cancer risk to an individual.

b - Noncancer risk hazard index values (a hazard index of 1.0 or lower indicates that no adverse effects would be expected).

to the levels of blood lead that is found. The risks from lead exposure to sensitive populations of children assumed to potentially live at the Deactivation Furnace site in the future are compared to the advisory standards established by the Center for Disease Control (CDC). CDC considers blood lead levels of less than 10 micrograms per deciliter (μg/dL) to be below any level of concern; and if levels are between 10 μg/dL and 15 μg/dL, some children may warrant further medical evaluation.

EPA has developed a lead uptake biokinetic (UBK) model that provides a method for predicting blood lead levels in populations of children (real and hypothetical) exposed to lead in air, food, drinking water, soil, indoor dust, and paint. The UBK model, version 5, was used to predict blood lead levels associated with the current soil lead levels analyzed at the Deactivation Furnace. Under a residential use scenario, children living at the site exposed to current soil concentrations would be at risk from health effects due to lead. The model predicted that 99.04 percent of children hypothetically exposed to existing soil lead levels at the Deactivation Furnace site would have blood lead levels exceeding 10 μg/dL. An estimated 88.63 percent of exposed children would have blood lead levels exceeding 15 $\mu g/dL$. In addition, the model predicts that the geometric mean of blood lead is 23.95 $\mu g/dL$. Accordingly, the child at average risk at the site in a future residential condition would require medical attention.

2.6.2 Environmental Evaluation

An ecological risk assessment (ERA) that includes the Deactivation Furnace was completed as part of the installation-wide RI/FS. The ERA report discusses the risks presented to representative animal species under the current site conditions. Table 5 summarizes risk values of potential toxicity to four wildlife species at the UMDA Deactivation Furnace site. Only metals with chronic hazard quotients greater than 1 are shown. Representative species analyzed for the site included the field mouse, the pronghorn antelope, the badger, and Swainson's hawk.

Chronic hazard quotients for potential toxicity to the field mouse were available for 11 metals. Lead dominated the risk with a hazard quotient of 266. Antimony and zinc also had chronic hazard quotients greater than 1.0. None of the metals had acute hazard quotients above 1.0. The ERA concludes that there is a significant chance for burrowing rodents to show effects of lead, antimony, and zinc at the site.

For the pronghorn antelope, chronic toxicity data only were available for lead and zinc, of which only lead data exceed chronic hazard quotient unity with a value of 1.1. Again, no acute hazard quotients were exceeded. The ERA concludes that there is a random chance that a pronghorn might receive an acute dose from eating large quantities (larger than used in the calculation) of soil, but chronic impacts to the animals are unlikely because of the small area of contamination compared to the ranging area for individuals.

For the badger, copper and lead were identified as chemicals of concern. Chronic hazard quotients for copper and lead were determined to be 17.1 and 24.6, respectively. No acute hazard quotients were exceeded. Despite the exceedance of chronic hazard quotient unity, the ERA concludes that there is small risk to the animal given the animal's ranging habits, which would carry it far beyond the furnace site.

For Swainson's hawk, metals toxicity information was only available for arsenic, cadmium, and lead. Only lead exceeded the chronic hazard quotient of 1.0, with a value of 120. There was no exceedance of acute hazard quotient unities, although the ERA indicates that there is increased potential for Swainson's hawk to receive an acute exposure to lead due to the possibility that structures and powerpoles in the vicinity of the furnace could be used as a hunting perch. However,

Table 5

SUMMARY OF ENVIRONMENTAL TOXICITY TO FOUR WILDLIFE SPECIES (ASSUMING NO REMEDIATION OCCURS)

Indicator Species and Metals	Estimated Exposure (mg/kg-day)	No Adverse Effects Level (mg/kg-day)	Chronic Hazard Quotient (HQ)	50% Lethal Dose (LD50) (mg/kg)	Acute HQ
Field Mouse					
Antimony	3.5E-01	3.50E-01	1.00E+00	5.48E+02	6.39E-04
Lead	8.51E+00	3.20E-02	2.66E+02	7.03E+01	1.21E-01
Zinc	1.91+01	9.60E+00	1.99E+00	1.68E+02	1.14E-01
Pronghorn Antelope					
Lead	2.87E+00	2.60E+00	1.10E+00	2.16E+02	1.33E-02
Badger					
Copper	5.65E+00	3.30E-01	1.71E+01	--	--
Lead	1.65E+00	6.70E-02	2.46E+01	--	--
Swainson's Hawk					
Lead	5.15E+00	4.30E-02	1.20E+02	1.05E+02	4.90E-02

the report also notes that the proximity (within about 1/2 mile) of higher quality hunting habitat and the relatively small area of contamination relative to the hawk's home range greatly reduces the potential for chronic ingestion to present a risk to the hawk.

2.6.3 Remedial Action Criteria

Applicable or relevant and appropriate requirements (ARARs) for the site include the Oregon Environmental Cleanup Rules (OAR 340-122), the RCRA Land Disposal Restrictions (LDRs) (40 CFR Part 268), the Oregon Solid Waste Management requirements (OAR 340-61), and the RCRA Solid Waste Disposal Facility Criteria (40 CFR Part 257 and 258). The Oregon Environmental Cleanup Rules require that if hazardous substances are released, the environment must be restored to background conditions, if feasible. If attainment of background conditions is not feasible, then the environment must be restored to the lowest concentration level that is both equally protective and feasible. The RCRA LDRs require RCRA characteristic hazardous waste to be treated prior to land disposal and require that the treatment meet specified standards. Nonhazardous solid wastes are disposed under the Oregon Solid Waste Management requirements and the federal Solid Waste Disposal Facility Criteria.

Other federal and state guidance documents "to be considered" (TBC) in establishing cleanup levels include the EPA's "Interim Guidance on Establishing Soil Lead Cleanup Levels at Superfund Sites" and adopted amendments to the Oregon Environmental Cleanup Rules OAR-340-122-045. EPA's guidance indicates 500 or 1,000 mg/kg lead in soils is an acceptable cleanup range for Superfund sites. This cleanup range is considered protective for direct soil contact in residential settings. The Oregon Environmental Cleanup Rules OAR-340-122 state that a soil cleanup level of 200 mg/kg is protective for residential areas, but a higher residual concentration also may be acceptable, based upon site-specific factors.

2.7 DESCRIPTION OF ALTERNATIVES

After screening numerous potential remedial responses, five remedial alternatives (including no action) were developed for the Deactivation Furnace soils. A description of each is provided in the following sections. With the exception of Alternative 1, each alternative considered three plausible options for the volume of soil to be treated. Those options included:

- Excavation of all soil with lead concentrations exceeding those equal to UMDA background. UMDA lead background concentrations were demonstrated to be approximately 8.37 mg/kg. The equivalent volume would be approximately 29,868 cubic yards.

- Excavation of 9,052 cubic yards of soil with lead concentrations exceeding 200 mg/kg.

- Excavation of 4,460 cubic yards of soil with lead concentrations exceeding 500 mg/kg.

2.7.1 Alternative 1: No Action

Evaluation of the no action alternative is required under CERCLA, serving as a common reference point against which other alternatives can be evaluated.

In Alternative 1, no containment, removal, or treatment of the soil at the Deactivation Furnace would occur, and no new controls would be implemented to prevent human exposure. However, existing security provisions that limit public access will continue until such time as the Army vacates the UMDA facility.

This alternative does not meet the Oregon requirement for cleanup to background, or the lowest levels that are protective, feasible, and cost-effective, nor does it achieve protection of human health and the environment within the guidelines of the NCP.

Alternative 1 requires no time to implement, and involves no capital or operations and maintenance (O&M) costs.

2.7.2 Alternative 3: Solidification/Stabilization of both RCRA Hazardous and Nonhazardous Wastes, and Disposal of All Solidified Wastes in UMDA Active Landfill

This alternative involves excavation of soil contaminated with lead in excess of the 500 mg/kg cleanup level and treatment by solidification/stabilization. The treatment process would take place on-site and involve the use of additives such as cement to bind the lead (and other metals), thus preventing their transport by water or air. Air monitoring would be conducted during soil excavation and treatment, and dust would be controlled using water sprays and/or plastic covers. Once the waste was treated, it would be tested to make sure that the lead in the stabilized waste would not leach. The solidified waste would then be transported via truck to the UMDA Active Landfill for disposal. Any wastewater generated during the solidification/stabilization process or though dust suppression would be treated in accordance with local, state, and federal regulations before disposal.

Prior to solidification/stabilization, the soil would be pretreated to separate oversized material including large-size-fraction elemental lead, munition fragments, rocks, and miscellaneous debris through screening. Once separated, the oversized material would undergo recycling or further pretreatment. Pretreatment would remove or reduce the size of any large-fraction lead such that it would not cause the solidified material to fail TCLP testing. The soil would then be solidified and stabilized. Railroad ballast would be included in the treatment. The ballast may be pretreated along with other soil or solidified and stabilized directly.

A number of solidification/stabilization applicable techniques are available; however, it is assumed that a cement-based process would be used. In cement-based solidification, reagents (proprietary or not) may be added to improve the physical characteristics and/or chemical stability of the solidified product. Soluble silicates are added to "flash set" cement and reduce the interference of metal ions with setting.

The solidified material would be transported to the on-site UMDA Active Landfill. The UMDA Active Landfill is not lined. As part of the eventual UMDA Active Landfill closure, the landfill would be capped as required by Oregon's solid waste disposal regulations (OAR 340-61) and federal solid waste disposal requirements (40 CFR Part 257 and 258). Disposal in the on-site landfill will provide additional containment. Barring physical disturbances of the solidified material, proper on-site disposal of the solidified material will provide long-term effective controls for inhalation exposure and direct contact/ingestion exposure at the site.

Alternative 3 would also include demolition and removal of the Deactivation Furnace buildings and concrete pads, removal of railroad ties and metal rails, and removal of approximately 5 cubic yards of soil and sediment at the base of the furnace collection sump. This soil and sediment may be contaminated with organic compounds. The contaminated soil and sediment would be transported, then treated and disposed at an off-site RCRA-permitted facility. The demolition debris, including the buildings, concrete pads, and railroad ties and rails, would be steam cleaned and disposed or recycled. The debris will be tested prior to its disposal or recycling as a nonhazardous waste to ensure adequate decontamination. Any debris which is shown to be hazardous will be disposed as such in an off-site RCRA-permitted facility.

The following costs for Alternative 3 at the three cleanup level options are as follows:

- Capital
  - Background: $1,886,000
  - 200 mg/kg $612,500
  - 500 mg/kg $338,800

- O&M
  - Background: $3,931,400
  - 200 mg/kg $1,201,400
  - 500 mg/kg $618,800

- Total Costs
  - Background: $5,817,400
  - 200 mg/kg $1,813,900
  - 500 ppm $957,600

The total costs as shown are equivalent to a present worth value since the remediation would be completed in less than a year.

A summary of the NCP criteria for evaluation of Alternative 3 is presented in Table 6. The following major ARARs are cited for the alternative.

- This alternative is consistent with the process described in the Oregon Environmental Cleanup Rules. Cleanup to background is evaluated to determine whether it is technically feasible. Because cleanup to background is not feasible administratively or economically, optimal cleanup levels that are feasible and that are protective and cost effective are also evaluated.

- This alternative will meet relevant and appropriate state and federal solid waste regulations for the disposal of the solidified, nonhazardous waste as described in OAR 340-61 and 40 CFR Parts 257 and 258, respectively.

- This alternative is consistent with all state ambient air quality standards for excavation and treatment processes.

- This alternative is consistent with all relevant and appropriate requirements of the RCRA for identification, treatment, storage, and disposal of hazardous waste.

2.7.3 Alternative 5: Solidification/Stabilization of RCRA Hazardous Waste Only, and Disposal of Solidified Wastes and Untreated Nonhazardous Wastes in UMDA Active Landfill

Under Alternative 5, soils with contamination exceeding the action level would be excavated and separated into RCRA hazardous and nonhazardous wastes. RCRA hazardous wastes require specific treatment such as solidification and/or disposal in a RCRA-permitted landfill specially designed to handle such wastes. Soils contaminated with lead at concentrations greater than approximately 900 mg/kg were shown in the FS to possess RCRA hazardous waste characteristics. In accordance with LDRs, those soils shown to be RCRA hazardous waste must first be treated to ensure the TCLP treatment standard of 5 mg/L is achieved. By separating soil containing greater than approximately

Table 6

SUMMARY OF NCP CRITERIA EVALUATION FOR ALTERNATIVE 3 SOLIDIFICATION/STABILIZATION OF RCRA AND NON-RCRA WASTES, AND DISPOSAL OF SOLIDIFIED WASTES IN THE UMDA LANDFILL

Compliance with ARARs	Overall Protection of Human Health and the Environment	Long-Term and Short-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume	Implementability	Cost
In accordance with Oregon Environmental Cleanup Rules, an optimal cleanup level that is protective, feasible, and cost effective is achieved. Recommended LDR treatment method utilized along with testing to ensure treatment standard is met UMDA Active Landfill must be capped and closed to comply with state and federal solid waste regulations.	Risks from nonhazardous and hazardous soils significantly reduced by S/S and on-site disposal. Slight risk remains by disposing of S/S materials in unlined landfill.	Reliability of S/S is high. Hazardous contaminants not destroyed, but risks reduced. S/S soils require proper disposal. Reliability of disposal at UMDA Active Landfill depends on following proper closure. Increase in dust production during excavation, S/S, and transportation to on-site landfill	Reduction in mobility but not toxicity; hazardous waste would be rendered nonhazardous waste by treatment; total waste volume increased due to addition of stabilizing materials.	Excavation easily implemented. S/S requires readily available specialist. On-site disposal and transportation easily implemented.	Background: $5,817,400 200 ppm: $1,813,900 500 ppm: $ 957,600

S/S - Solidification/Stabilization
LDR - Land Disposal Restrictions
UMDA - United States Army Depot Activity, Umatilla

900 mg/kg lead from those excavated soils, only those soils requiring treatment under RCRA would be solidified. Such separation and limited treatment reduces the cost of the alternative.

Extensive soil sampling would occur to confirm accurate separation. The RCRA hazardous wastes would be pretreated and solidified/stabilized as described for Alternative 3. The solidified soil would then be tested to make sure the lead was not leaching from the soil, and transported to the UMDA Active Landfill for disposal. The nonhazardous wastes would not be treated; they would be loaded into trucks and transported to the UMDA Active Landfill for disposal. Associated debris, including building structures, concrete pads, and railroad ties and rails will be decontaminated and disposed or recycled as described in Alternative 3. Air monitoring and dust control would be implemented.

The costs for Alternative 5 at the three cleanup level options are as follows:

- Capital
  - Background: $1,752,300
  - 200 mg/kg $646,400
  - 500 mg/kg $405,800

- O&M
  - Background: $389,400
  - 200 mg/kg $389,400
  - 500 mg/kg $389,400

- Total Costs
  - Background: $2,141,700
  - 200 mg/kg $1,035,800
  - 500 mg/kg $795,200

The following major ARARs are cited for Alternative 5.

- This alternative is consistent with the process described in the Oregon Environmental Cleanup Rules. Cleanup to background is evaluated to determine whether it is technically feasible. Because cleanup to background is not feasible administratively or economically, optimal cleanup levels that are feasible and that are protective and cost effective also are evaluated.

- This alternative will meet relevant and appropriate state solid waste regulations for the disposal of the solidified, nonhazardous waste as described in OAR 340-61 and 40 CFR Parts 257 and 258, respectively.

- This alternative is consistent with all state ambient air quality standards for excavation and treatment processes.

- This alternative is consistent with all relevant and appropriate requirements of RCRA for identification, treatment, storage, and disposal of hazardous waste.

2.7.4 Alternative 6: Solidification/Stabilization of both RCRA Hazardous and Nonhazardous Wastes, and Disposal of All Solidified Wastes in Off-Site Solid Waste Landfill

This alternative involves excavation and treatment by solidification/stabilization of all soil contaminated with lead at concentrations exceeding the cleanup levels as discussed for Alternative 3. Air monitoring and dust control measures would be implemented and the treated waste would be tested. Alternative 6 differs from Alternative 3 in that the solidified waste would be transported off-site to a lined solid waste disposal facility, as opposed to the unlined on-site UMDA Active Landfill. Since the off-site solid waste facility is lined, the degree of long-term effectiveness is increased.

The costs for Alternative 6 at the three cleanup level options are as follows:

- Capital
  - Background: $4,937,800
  - 200 mg/kg $1,537,400
  - 500 mg/kg $814,800

- O&M
  - Background: $3,931,400
  - 200 mg/kg $1,201,400
  - 500 mg/kg $618,800

- Total Costs
  - Background: $8,869,200
  - 200 mg/kg $2,738,800
  - 500 mg/kg $1,433,600

The following major ARARs are cited for Alternative 6.

- This alternative is consistent with the process described in the Oregon Environmental Cleanup Rules. Cleanup to background is evaluated to determine whether it is technically feasible. Because cleanup to background is not feasible administratively or economically, optimal cleanup levels that are feasible and that are protective and cost effective also are evaluated.

- This alternative will meet relevant and appropriate state solid waste regulations for the disposal of the solidified, nonhazardous waste as described in OAR 340-61 and 40 CFR Parts 257 and 258, respectively.

- This alternative is consistent with all state ambient air quality standards for excavation and treatment processes.

- This alternative is consistent with all relevant and appropriate requirements of the RCRA for identification, treatment, storage, and disposal of hazardous waste.

2.7.5 Alternative 10: Transport of RCRA Hazardous Wastes to RCRA Facility for Solidification/Stabilization and Disposal of Solidified Wastes, and Disposal of Nonhazardous Wastes in Off-Site Solid Waste Landfill

Under this alternative, all soil with lead concentrations exceeding the cleanup standard would be excavated. Air monitoring and dust controls would be employed during excavation. The soils with greater than 900 mg/kg lead would then be separated from the excavated soil in order to isolate those soils classified as RCRA hazardous waste. Intensive sampling and analyses would be included in order to accurately separate the soils. Associated debris would be decontaminated and disposed or recycled as described in Alternative 3.

Following separation, the soils identified as RCRA hazardous waste will be transported to an off-site RCRA-permitted TSD facility. The hazardous waste would be solidified/stabilized by a proprietary method so that they no longer exhibit hazardous characteristics. The waste would then be disposed of at the TSD facility.

The nonhazardous soils with lead concentrations less than 900 mg/kg would be disposed of at an off-site solid waste landfill.

The costs for Alternative 10 at the three cleanup level options are as follows:

- Total Costs
  - Background: $5,376,100
  - 200 mg/kg $2,829,300
  - 500 mg/kg $2,283,000

There are no O&M costs since the alternative is a turnkey operation involving no on-site processing equipment.

The following major ARARs are cited for Alternative 10.

- This alternative is consistent with the process described in the Oregon Environmental Cleanup Rules. Cleanup to background is evaluated to determine whether it is technically feasible. Because cleanup to background is not feasible administratively or economically, optimal cleanup levels that are feasible and that are protective and cost effective also are evaluated.

- This alternative will meet relevant and appropriate state solid waste regulations for the disposal of the solidified, nonhazardous waste as described in OAR 340-61 and 40 CFR Parts 257 and 258, respectively.

- This alternative is consistent with all state ambient air quality standards for excavation and treatment processes.

- This alternative is consistent with all relevant and appropriate requirements of the RCRA for identification, treatment, storage, and disposal hazardous waste.

2.8 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

2.8.1 Threshold Criteria

Overall Protection of Human Health and the Environment. All alternatives except Alternative 1: No Action are protective of human health and the environment. With the exception of Alternative 1, all alternatives would protect approximately 95 percent of children exposed to site soil from exceeding blood lead levels of 10μg/dL. A 95 percent protection level also can be expressed as a 5 percent risk level as shown in Table 7 at the 500 mg/kg cleanup level. At the 200 mg/kg and background cleanup level, approximately 99.9 percent of the children are protected. By removing soil contaminated with lead at even the highest cleanup level of 500 mg/kg, the concentration of all other metals would be reduced to either that of background or to a level such that hazard quotient for noncarcinogenic effects would be reduced below 1.0. None of the metals whose concentration would not be reduced to background at the 500 mg/kg cleanup level are listed as carcinogens.

Alternatives 3 and 6 provide the highest levels of overall protection since all soil above the cleanup level would be stabilized/solidified before being disposed. Under Alternative 3, all treated waste would be disposed of at the UMDA Active Landfill, which is unlined. The overall protectiveness of Alternative 6 is similar to Alternative 3 except that the stabilized/solidified waste would be disposed of off-site at a lined solid waste landfill. Alternative 6 would, therefore, provide added groundwater protection. However, because all the wastes would be treated and both landfills would be covered, the probability that the lead would leach is low, and the added protectiveness of the liner would not be necessary. Alternatives 10 and 5 are less protective because they would treat only the RCRA hazardous waste. However, Alternative 10 disposes all waste off-site at lined landfills, thereby providing the added groundwater protection. Alternative 5 disposes all waste in the unlined UMDA Active Landfill.

Potential ecological effects also were evaluated at these three cleanup levels for all metals, including lead. Again, lead was most important with regards to adverse impacts. At lead concentrations above background, potential adverse impacts to wildlife were predicted to be primarily limited to burrowing rodents. Raptorial birds, such as hawks, which feed within areas containing

Table 7

EFFECTIVENESS AND COST OF ALTERNATIVES AS A FUNCTION OF CLEANUP LEVELS FOR LEAD-RESIDENTIAL SCENARIO

Alternative Carried Forward for Detailed Analysis	Cleanup Level (ppm lead)	Risk Levels in Soil Remaining at the Site, Based on 10 $\mu g/L$ Blood Lead *	Risk Levels in Soil Remaining at the Site, Based on 15 $\mu g/dL$ Blood Lead *	Mass of Contaminated Soil by Alternative (tons)	Total Cost of Each Alternative
Alt 1: No Action	2,618 **	99.04%	88.63%	0	$0
Alt 3: Excavation, Component Separation with Lead Recycling, S/S of All Wastes, On-Site Disposal of Solidified Material	500 200 10	5.52% 0.06% 0.01%	0.31% 0.00% <0.01%	6,264 12,220 40,322	$957,600 $1,813,900 $5,817,400
Alt 5: Excavation, Component Separation with Lead Recycling, S/S of Hazardous Waste and On-Site Disposal, On-Site Disposal of Nonhazardous Solid Waste	500 200 10	5.52% 0.06% <0.01%	0.31% 0.00% <0.01%	6,264 12,220 40,322	$795,200 $1,035,800 $2,141,700
Alt 6: Excavation, Component Separation with Lead Recycling, S/S of All Wastes, Off-Site Disposal of Solidified Material	500 200 10	5.52% 0.06% 0.00%	0.31% 0.00% 0.00%	6,264 12,220 40,322	$1,433,600 $2,738,800 $8,869,200
Alt 10: Excavation, Off-Site Disposal of Hazardous Waste to RCRA Subtitle C TSD facility, Off-Site Disposal of Nonhazardous Solid Waste	500 200 10	5.52% 0.06% <0.01%	0.31% 0.00% <0.01%	6.264 12,220 40,322	$2,283,000 $2,829,300 $5,376,100

* Risk is based on direct contact by a child 0 to 7 years of age with soil: Ingestion, inhalation, and dermal contact. The values are the percentage of the population of children that are estimated to have greater than 10 or 15 μg of lead per dL of blood. See text for explanation of these levels.

** The value of 2,618 ppm is the 95% upper confidence limit on the mean soil lead value for the site (Phase I data only).

S/S - Solidification/Stabilization

LDR - Land Disposal Restrictions

UMDA - United States Army Depot Activity, Umatilla soil-lead concentrations greater than 200 mg/kg, also may be impacted although the extent of such areas in comparison to the birds' natural range is expected to be quite small. Other representative wildlife in the area such as badgers, coyotes, and pronghorn antelope were not predicted to be adversely impacted by the site at any of the three cleanup levels.

Residual risks associated with children's blood levels exceeding advisory blood lead levels for each alternative at the three cleanup levels are compared to related costs in Table 7.

Excavation to such an extent that the lead soil concentration is reduced to no greater than 500 mg/kg provides the best balance of net risk reduction and cost effectiveness. The level of protectiveness provided by the 500 mg/kg cleanup for lead is consistent with EPA guidance. Additional excavation to 200 mg/kg or background lead concentrations achieve only a slightly greater risk reduction at significantly increased costs.

Achievement of Applicable or Relevant and Appropriate Requirements (ARARs). Alternatives 3, 5, 6, and 10 comply with all ARARs. There are no federal or state soil cleanup standards for lead or other related metals. In their absence, the most notable ARAR is the Oregon Environmental Cleanup Rules. These regulations specify a remedial decision process that requires cleanup to background levels, or if that is not feasible, cleanup to levels that are protective, feasible, and cost-effective. Recently adopted amendments to the Oregon Environmental Cleanup Rules state that a soil cleanup level of 200 mg/kg of lead is protective for residential areas, but a higher residual concentration also may be acceptable, based upon site-specific factors. EPA has published guidance that indicates 500 to 1,000 mg/kg lead in soils as an acceptable cleanup range for Superfund sites.

All cleanup levels were evaluated for Alternatives 3, 5, 6, and 10. Alternatives 3, 5, 6, and 10 attain EPA's goal of protecting approximately 95 percent of children from having blood lead levels exceeding 10 μg/dL at the 500 mg/kg lead cleanup level.

All nonhazardous solid waste disposal conducted under Alternatives 3, 5, 6, and 10 would comply with Oregon Solid Waste Management requirements (OAR 340-61). In order to fully comply with these requirements, approval of a UMDA Active Landfill closure plan and issuance of a Landfill Closure Permit by ODEQ would be required under Alternatives 3 and 5. All alternatives comply with the RCRA Solid Waste Disposal Facility Criteria, 40 CFR Parts 257 and 258.

2.8.2 Primary Balancing Criteria

Long-Term Effectiveness. In Alternative 1, no risk reduction is attained and therefore, the alternative does not demonstrate long-term effectiveness. The highest level of long-term effectiveness and permanence at the site would be gained under Alternatives 3 and 6, because they both stabilize/solidify all the contaminated soil at the site and dispose of the treated waste at the UMDA Active Landfill and off-site solid waste landfill, respectively. The Active Landfill is not lined; however, given that the groundwater occurs at approximately 59 feet below the base of the landfill, rainfall is low in the area, and the landfill would be covered in accordance with federal and Oregon regulations, future leaching of treated waste to groundwater is not anticipated. In the unlikely event that treated waste started to leach, the off-site lined landfill would be more effective. Alternative 10 provides the next highest level of long-term effectiveness. Alternative 10 only treats the RCRA hazardous waste; however, all waste is disposed of at off-site lined landfills. Alternative 5 is less effective since, similar to Alternative 10, only the RCRA hazardous waste would be treated, and all waste would be disposed of at the unlined UMDA Active Landfill.

Reduction of Toxicity, Mobility, or Volume of the Contaminants Through Treatment. Alternative 1 does not reduce the toxicity, mobility, or volume of contaminants. Alternatives 3 and 6 use solidification/stabilization to greatly reduce the mobility of lead and other metals in all contaminated soils at the site. Under Alternative 3, the solidified material would be disposed of in the UMDA Active Landfill. The landfill would further reduce mobility since a permanent low permeability cover would be placed over the treated waste to prevent infiltration of any precipitation. The placement of the cover would take place after the solidified waste is disposed under the landfill's planned closure and not as a part of Alternative 3. Under Alternative 6, the solidified material would be disposed off-site at a lined solid waste landfill. In addition to the liner, the landfill would be covered, which would provide additional reduction in mobility. Alternatives 5 and 10 reduce the mobility of metals only in that portion of the soils to be classified as RCRA hazardous waste, through solidification/stabilization and disposal of the treated waste. The treated soil and remaining nonhazardous soil would be buried in the on-site UMDA Active Landfill (Alternative 5) or an off-site lined solid waste landfill (Alternative 10), thus reducing the mobility of the metals. The landfills used for Alternative 10 provide additional mobility reduction since they are lined.

Short-Term Effectiveness. Potential short-term impacts of soil excavation and handling under Alternatives 3, 5, 6, and 10 would be the generation of dust. Alternatives 3 and 6 would generate the greatest amount of dust on-site since all wastes would be excavated and treated entirely on the installation. Under Alternative 5, all of the waste would be excavated but only the RCRA hazardous waste would be treated on-site. Under Alternative 10, all waste would be excavated but treatment of the RCRA hazardous waste occurs off-site. Use of water sprinklers to control dust and plastic sheeting to cover soil piles would minimize risk to on-site workers and the spread of dust in the environment.

Implementability. All of the alternatives are implementable. However, Alternatives 5 and 10 are harder to implement, because they would involve separation of the soils into RCRA hazardous and nonhazardous waste components. This would require sampling and analysis of the wastes to assure that accurate separation occurred. Alternatives 3 and 6 would not require waste separation. Alternative 3, 5, and 6 include on-site treatment which would involve procurement, mobilization, and demobilization of a mobile treatment facility. A number of vendors are available for implementation of the on-site solidification and stabilization treatment. Alternative 10 would be easier to implement in this regard, since treatment and disposal of wastes would occur at an existing off-site facility.

Cost. The estimated capital, O&M, and total costs for each remedial alternative at the 500 mg/kg cleanup level are presented below. The total costs are equivalent to present worth costs in each case since each alternative would be implemented within a 1-year period.

- Alternative 1
  - Capital: $0
  - O&M: $0
  - Total Cost: $0

- Alternative 3
  - Capital: $338,800
  - O&M: $618,800
  - Total Cost: $957,600

- Alternative 5
  - Capital: $405,800
  - O&M: $389,400
  - Total Cost: $795,200

- Alternative 6
  - Capital: $814,800
  - O&M: $618,800
  - Total Cost: $1,433,600

- Alternative 10
  - Capital: $2,283,000
  - O&M: $0
  - Total Cost: $2,283,000

2.8.3 Modifying Criteria

State Acceptance. The State of Oregon concurs with the Army and EPA in the selection of Alternative 3 and the cleanup level of 500 mg/kg of lead. In addition, the state is satisfied that the state's remedial action process was followed in evaluating remedial action for the Deactivation Furnace.

Public Acceptance. Based on the absence of any negative comments, it is assumed the public supports the selection of Alternative 3.

2.9 SELECTED REMEDY

The selected remedy to clean up the soil contamination associated with the UMDA Deactivation Furnace is Alternative 3:

- Alternative 3 - Solidification and stabilization of all soil with lead concentrations exceeding the cleanup level of 500 mg/kg and disposal of the solidified soil in the UMDA Active Landfill.

This alternative was selected because it is protective, feasible, and cost-effective. The primary selected technology is solidification and stabilization. It is a proven technology for treatment of soil contaminated with metals with a number of process options available. The specific process option will be identified by site-specific treatability studies. Approximately 11 months will be required for the development of performance specifications and to complete the necessary procurement actions. The actual treatment and disposal period is estimated at between an additional 2 to 6 months. The estimated present worth cost of Alternatives 3 is $957,600. The estimated volume of soil to be removed and treated is 4,640 cubic yards.

The major components of the selected remedy include the following:

- Demolition and decontamination of building structures, concrete pads, and railroad ties and rails;
- Excavation of approximately 5 cubic yards of sump soils and sediment contaminated with organic compounds. The sump soils and sediments identified as a hazardous waste will be transported to a RCRA-permitted TSD facility for treatment and disposal;
- Excavation of soils with lead concentrations exceeding 500 mg/kg;
- Mobilization of the treatment facilities;

- Screening/sieving of the soil to remove oversized debris, including large-size fraction elemental lead.
- Solidification and stabilization of the soil through a cement-based process.
- Material testing and laboratory analysis to ensure adequate stabilization; and
- Transportation of the solidified and stabilized soil to the UMDA Active Landfill for disposal.

Alternative 3 will attain the following remediation goals:

- Soils will be excavated to the cleanup level of 500 mg/kg lead. This level of cleanup will attain the recommended goal of protecting 95% of children exposed to soil from exceeding blood lead levels of 10 μg/dL.
- Excavated soils will be treated in such a manner as to immobilized the lead and other metals present through solidification and stabilization. At a minimum, the degree of immobilization will be such that no treated soil will produce a TCLP extract containing greater than 5 mg/L of lead.
- The treated soil will be disposed of in the UMDA Active Landfill, eliminating all potential for direct contact and further reducing contaminant mobility.

2.10 STATUTORY DETERMINATIONS

The selected remedy satisfies the requirements under Section 121 of CERCLA to:

- Protect human health and the environment;
- Comply with ARARs;
- Be cost-effective;
- Utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and
- Satisfy the preference for treatment as a principal element.

2.10.1 Protection of Human Health and the Environment

In summary, Alternative 3 would achieve substantial risk reduction by first excavating all soil contaminated above the cleanup action level of 500 mg/kg of lead. The 4,640 cubic yards of excavated soil will then be treated to reduce contaminant mobility. The cleanup would focus on the upper 2 to 15 inches of soil, where the highest concentrations exist. No soil with lead concentrations greater than 500 mg/kg has been found at depths greater than 15 inches. Long-term management is not required because contamination will be removed. Alternative 3 achieves this risk reduction using an established treatment technology, solidification, where all soils contaminated above the cleanup level are incorporated into a cement/soil matrix, reducing contaminant mobility. In addition, contaminant mobility would be further reduced by placing the treated soils in the UMDA Active Landfill.

Human health risks associated with direct exposure of children to lead in the soil will be reduced such that the blood lead levels of 95% of the children exposed to site soils under a residential scenario will not exceed 10 μg/dL. Environmental protection is achieved by reducing lead and other metal concentrations such that excessive adverse impacts to wildlife are not anticipated.

No unacceptable short-term risks or cross-media impacts will be caused by implementation of Alternative 3. During remediation, adequate protection will be provided to the community by controlling dust generated during material handling operations and transport. In addition, workers will be provided with personal protective equipment and air monitoring during all phases of remediation.

2.10.2 Compliance with ARARs

The discussion below addresses compliance of the selected remedy with chemical-specific, location-specific, and action-specific ARARs.

Chemical-Specific ARARs. The Oregon Environmental Cleanup Rules (OAR 340-122), which specify generic cleanup standards, are ARARs for the UMDA Deactivation Furnace. In summary, the regulations state that in the event of a release of hazardous substances, cleanup shall be to background or, if that is not feasible, to the lowest level that is protective, feasible, and cost-effective.

Recently adopted amendments to the state environmental cleanup rules (OAR 340-122-045) state that a soil cleanup level for lead of 200 mg/kg is protective for residential areas, but a higher residual concentration also may be acceptable, based upon site-specific factors. The 200 mg/kg level cited in the amendment is not considered an ARAR, but is to be considered. Other guidance to be considered includes that of EPA which indicates that 500 to 1,000 mg/kg of lead is an acceptable cleanup range for Superfund sites.

In order to identify the lowest level that is protective, feasible, and cost-effective, cleanup levels to background, 200 mg/kg, and 500 mg/kg lead were evaluated. As shown in Table 7, Alternative

3 costs for cleanup to background and 200 mg/kg lead were 6.1 and 1.9 times greater, respectively, than the costs for cleanup to 500 mg/kg lead. Since the 500 mg/kg cleanup level provides adequate protection, the background and 200 mg/kg cleanup levels were determined not to be cost effective.

Under RCRA (40 CFR 261), soils producing a TCLP extract containing lead at concentrations greater than 5 mg/L are EPA D008 hazardous wastes based upon toxicity characteristics. Soil from the Deactivation Furnace containing greater than 900 mg/kg lead typically will exhibit such characteristics. RCRA regulations are, therefore, considered applicable.

Alternative 3 provides for solidification and stabilization of all soil containing lead at concentrations greater than 500 mg/kg. In doing so, the soil will be treated such that it no longer exhibits toxic characteristics, and therefore, will not be considered an EPA D008 hazardous waste.

Location-Specific ARARs. No location-specific ARARs are identified for this Alternative. Although areas of the UMDA installation provide critical habitat for threatened or endangered species, no activities at the Deactivation Furnace are expected to impact those habitats.

Action-Specific ARARs. The treatment and disposal of solidified and stabilized soil at the UMDA Active Landfill will comply with the relevant and appropriate sections of the RCRA LDRs (40 CFR 268), the Oregon Solid Waste Management Regulation (OAR 340-61), and the RCRA Solid Waste Disposal Facility Criteria (40 CFR 257 and 258). The RCRA LDRs establish treatment standards for lead contaminated soils, allowing subsequent land disposal as a nonhazardous solid waste. The Oregon Solid Waste Regulations govern the transport, storage, and disposal of nonhazardous solid wastes, including general rules pertaining to specified wastes. The RCRA Solid Waste Disposal Criteria sets forth the minimum federal criteria for solid waste landfills, including facility design and operating criteria and closure and post-closure care requirements. In addition, all activities under Alternative 3 will comply with the Oregon Ambient Air Quality Standards. These standards include those for lead and particulate emissions.

2.10.3 Cost-Effectiveness

The selected remedy provides overall effectiveness proportionate to its costs. Alternative 3 costs are substantially less than those of Alternatives 6 and 10 while providing equal overall protection of human health and the environment. Alternative 3 cost is greater than Alternative 5. However, all wastes are solidified in Alternative 3 as opposed to only those soils classified as RCRA hazardous waste. Such complete treatment will greatly reduce the mobility of the contaminant as a whole.

2.10.4 Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

The selected remedy provides a high level of long-term effectiveness and permanence. Solidification and stabilization constitutes the best demonstrated available technology for treatment of D008 waste. Stabilization and solidification produces a matrix of interlocked particles and chemically transforms contaminants into less soluble forms, thereby increasing the strength and decreasing the permeability and leachability of the treated soil. In addition to treatment, the soil will be disposed in the UMDA Active Landfill. The landfill will be capped, significantly reducing infiltration of precipitation and thus potential leaching of contaminants.

2.10.5 Preference for Treatment as a Principal Element

The statutory preference for treatment is satisfied by using solidification and stabilization as the primary means for remediating the contamination. Solidification converts the soil into a solid by forming a matrix of interlocked particles. Stabilization reduces the solubility and chemical reactivity of the contaminants in the soil by changing the chemical state or through physical entrapment. These treatment processes combine to form the principal element in the selected remedy.

2.11 DOCUMENTATION OF SIGNIFICANT CHANGES

The selected remedy was the preferred alternative presented in the Proposed Plan. Since the issuance and approval of the Proposed Plan, no significant changes have been made. The only change in the selected remedy as presented in the Proposed Plan is in the time period required for the development of performance specifications. The Proposed Plan indicated 6 months would be required as opposed to 11 months as stated above.

3. RESPONSIVENESS SUMMARY

The final component of the ROD is the Responsiveness Summary, which serves two purposes. First, it provides the agency decision makers with information about community preferences regarding the remedial alternatives and general concerns about the site. Second, it demonstrates to members of the public how their comments were taken into account as a part of the decision-making process.

Historically, community interest in the UMDA installation has centered on the impacts of installation operations on the local economy. Interest in the environmental impacts of UMDA activities has typically been low. Only the proposed chemical demilitarization program, which is separate from facility remediation programs, has drawn substantial comment and concern.

As part of the installation's community relations program, in 1988 the UMDA command assembled a TRC composed of elected and appointed officials and other interested citizens from the surrounding communities. Quarterly meetings provide an opportunity for UMDA to brief the TRC on installation environmental restoration projects and to solicit input from the TRC. Two TRC meetings were held during preparation of the supplemental investigation and FS for the Deactivation Furnace Soils Operable Unit: one on February 19, 1992, and the other on August 12, 1992. In those meetings, the TRC was briefed on the scope and results of the supplemental investigation and the methodology of and remedial alternatives considered in the FS. The response received from the TRC was positive; the members showed particular interest in and support for the solidification and stabilization alternative.

Notice of the public comment period, public meeting, and availability of the Proposed Plan was published in the East Oregonian newspaper. The Feasibility Study and Proposed Plan for the Deactivation Furnace Soils Operable Unit were released to the public on August 31, 1992. The public comment period started on that date and ended on September 30, 1992.

A public meeting was held at Armand Larive Junior High School, Hermiston, Oregon, on September 15, 1992, to inform the public of the preferred alternative and to seek public comments. At this meeting, representatives from UMDA, USATHAMA, EPA, ODEQ, and USACE, Seattle District presented the proposed remedy. Approximately eight persons including media representatives attended the meeting. There were no questions asked during the informal question-and-answer period and no formal comments or statements were received during the public meeting. No other comments, either verbal or written, were received by UMDA, EPA, or ODEQ during the public comment period.

Appendix A

STATE OF OREGON'S LETTER OF CONCURRENCE

Oregon

DEPARTMENT OF
ENVIRONMENTAL
QUALITY

OCTOBER 20, 1992

Ms. Dana Rassmussen
Regional Administrator
U. S. Environmental Protection Agency
1200 Sixth Avenue
Seattle, WA 98101

Re: Umatilla Depot Activity
Furnace Soils Operable Unit
Record of Decision

Dear Ms. Rassmussen:

The Oregon Department of Environmental Quality (DEQ) has reviewed the draft Record of Decision, for the Deactivation Furnace Soils Operable Unit at the U.S. Army's Umatilla Depot Activity. I am pleased to advise you that DEQ concurs with the remedy recommended by EPA and the Army (i.e., solidification of the contaminated soils and disposal in the Active Landfill at the Depot). I find that this alternative is protective, and to the maximum extent practicable is cost effective, uses permanent solutions and alternative technologies, is effective and implementable. Accordingly, it satisfies the requirements of ORS 465.315, and OAR 340-122-040 and 090.

It is understood that placement of treated soils from this operable unit into the Active Landfill is subject to the requirements of a closure permit for the landfill to be issued by this Department. Although a detailed closure plan has not yet been received, and a closure permit not yet issued, DEQ approves of this proposal in concept. I have no reason to believe at this time that DEQ's final approval would be withheld.

If you have any questions concerning this matter, please contact Bill Dana of DEQ's Environmental Cleanup Division at (503) 229-6530 or Ed Liggett of DEQ's Eastern Region Office at (503) 276-4063.

Sincerely,

Fred Hansen

Fred Hansen
Director

WD:m
SITE\SM35\SM4741
cc: Lewis D. Walker, DOD
LTC. William McCune, UMDA
Harry Craig, EPA-OOO
Bill Dana, SRS, DEQ
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